

1. A method for reconfiguring, from an original configuration to a new configuration, a striped logical device distributed across a plurality of physical disk drives in a disk array storage device and responsive to input-output requests from a host application, said method comprising the steps of:

- A) making a copy of the striped logical device in the original configuration concurrently with operations between the host application and the logical device in its original configuration,
- B) isolating the copy,
- C) converting the logical device to its new configuration whereby the host application thereafter can interact with the logical device in its new configuration,
- D) transferring data from the isolated copy to corresponding locations according to the new configuration concurrently with operations between the host application and the logical device in its new configuration, and
- E) responding to an input-output request from the host application for non-transferred data according to the new configuration by transferring data from a corresponding location in the copy to location in the

25                   logical device identified by the input-output  
request.

2.   A method as recited in claim 1 wherein the data processing system includes other physical disk drives and the step of making a copy of the striped logical device includes the steps of:

- 5                   i)   generating for the logical device a first list of all data locations on the physical disk drives according to the original configuration, and
- 10                   ii) replicating the data in the logical device onto the other physical disk devices according to the original configuration.

3.   A method as recited in claim 2 wherein said step of converting the logical device to its new configuration includes:

- 5                   i)   generating a second list of all data locations on the physical disk drives that are to receive data from the original configuration according to the new configuration, and
- 10                   ii) generating the new configuration whereby host requests are directed to the storage locations as established by the second configuration.

4. A method as recited in claim 3 wherein said transferring step includes iteratively transferring data from the other physical disk drives containing the replicated data to a corresponding physical disk drive location according to the original configuration and information in the first list.
5. A method as recited in claim 4 wherein said response to an input-output request includes transferring the data according to the second configuration and information on the second list.
6. A method as recited in claim 1 wherein the data processing system includes other physical disk drives and wherein:
- A) the step of making a copy of the striped logical device includes the steps of:
- i) generating for the logical device a first list of all data locations on the physical disk drives according to the original configuration, and
- ii) replicating the data in the logical device onto the other physical disk devices according to the original configuration;

B) said step of converting the logical device to its new configuration includes:

15 i) generating a second list of all data locations on the physical disk drives that are to receive data from the original configuration according to the new configuration, and

20 ii) generating the new configuration whereby host requests are directed to the storage locations as established by the second configuration,

C) said data copying step includes iteratively transferring data from the other physical disk drives containing the replicated data to a corresponding physical disk drive location according to the original configuration and information in the first list, and

D) said response to an input-output request includes transferring the data according to the second configuration and information on the second list.

7. A method as recited in claim 6 wherein the disk array storage device includes a cache memory for storing data from the host application temporarily before transfer to a physical disk drive, said method additionally including the steps of:

- A) generating a third list of all data in the cache memory to be transferred to the physical disk drives when said conversion occurs, and
- B) transferring the data from the cache memory to the replicated data according to its first configuration data location and in response to the third list.

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- 8. A method as recited in claim 7 wherein a different process controls each of said transferring steps, said processes operating concurrently.
- 9. A method as recited in claim 7 wherein a different process controls each of said transferring steps and wherein said processes operate concurrently and independently of the operation of the host application.
- 10. A data store in which a striped logical device distributed across a plurality of physical disk drives in the disk array storage device in an original configuration can be reconfigured to a new configuration concurrently with and transparently to the processing of input-output requests from a host application, said data store comprising:
  - A) copying means for making a copy of the striped logical device in the original configuration concurrently with operations between the host

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- 10 application and the logical device in its original  
configuration,
- B) means for isolating the copy,
- C) means for converting the logical device to its new  
15 configuration whereby the host application thereafter  
can interact with the logical device in its new  
configuration,
- D) first transfer means for transferring data from the  
isolated copy to corresponding locations according to  
the new configuration concurrently with operations  
20 between the host application and the logical device  
in its new configuration, and
- E) second transfer means for responding to an input-  
output request from the host application for non-  
transferred data according to the new configuration  
25 by transferring data from a corresponding location in  
the copy to location in the logical device identified  
by the input-output request.

11. A data store as recited in claim 10 additionally includes  
other physical disk drives wherein said copying means  
includes a first list of all data locations on the  
physical disk drives according to the original  
5 configuration, said copy means replicating the data in the

logical device onto the other physical disk devices according to the original configuration.

- 5      12. A data store as recited in claim 11 wherein said conversion means includes a second list of all data locations on the physical disk drives that are to receive data from the original configuration according to the new configuration, said conversion means generating the new configuration whereby host requests are directed to the storage locations as established by the second configuration.
- 5      13. A data store as recited in claim 12 wherein said first transfer means includes means for iteratively transferring data from the other physical disk drives containing the replicated data to a corresponding physical disk drive location according to the original configuration and information in said first list.
14. A data store as recited in claim 13 wherein said second transfer means includes means responsive to information on said second list.
15. A data store as recited in claim 10 additionally including other physical disk drives wherein:

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- A) said copying means includes a first list of all data locations on the physical disk drives according to the original configuration,
- B) said conversion means includes a second list of all data locations on the physical disk drives that are to receive data from the original configuration according to the new configuration,
- 10 C) said first transfer means includes means for iteratively transferring data from the other physical disk drives to a corresponding physical disk drive location according to the new configuration in response to information in said first list, and
- 15 D) said second transfer means includes means responsive to information on said second list.

16. A data store as recited in claim 15 wherein the disk array storage device includes a cache memory for storing data from the host application temporarily before transfer to a physical disk drive, said data store additionally

5 including:

- A) a third list of all data in the cache memory to be transferred to the physical disk drives, and
- B) third transfer means for transferring the data from the cache memory to the replicated data according to



10                    its first configuration data location and information  
                     in said third list.

17. A data store as recited in claim 16 wherein said copying means and said first, second and third transfer means operate concurrently.
18. A method as recited in claim 16 wherein said copying means and said first, second and third transfer means operate concurrently with each other and operate concurrently and independently of a host application.
19. A data store in which a striped logical device distributed across a plurality of physical disk drives in the disk array storage device in an original configuration can be reconfigured to a new configuration concurrently with and transparently to the processing of input-output requests from a host application, said data store comprising:
- 5                    A) a plurality of additional physical disk drives that replicate the data of the striped logical device in the original configuration concurrently with operations between the host application and the logical device in its original configuration,
- 10                    B) a control that isolates the replicated copy,

- 15 C) a configuration file that defines the logical device  
in its new configuration and enables the host  
application to interact with the logical device in  
its new configuration,
- 20 D) a data transfer background process that transfers  
data from the isolated copy to corresponding  
locations according to the new configuration  
concurrently with operations between the host  
application and the logical device in its new  
configuration, and
- 25 E) an input-output request handler that responds to an  
input-output request from the host application for  
non-transferred data according to the new  
configuration by transferring data from a  
corresponding location in the copy to location in the  
logical device identified by the input-output  
request.

20. A data store as recited in claim 19 additionally includes  
a first list of all data locations on the physical disk  
drives according to the original configuration, said  
plurality of additional physical disk drives replicating  
5 the data in the logical device onto the other physical  
disk devices according to the original configuration.

21. A data store as recited in claim 20 additionally comprising a second list of all data locations on the physical disk drives that are to receive data from the original configuration.
22. A data store as recited in claim 21 wherein said data transfer background process iteratively transfers data from the other physical disk drives containing the replicated data to a corresponding physical disk drive location according to the original configuration and information in said first list.
23. A data store as recited in claim 22 wherein said input-output request handler responds to information on said second list.
24. A data store as recited in claim 19 additionally including other physical disk drives wherein:
  - A) a first list of all data locations on the physical disk drives according to the original configuration;
  - B) a second list of all data locations on the physical disk drives that are to receive data from the original configuration according to the new configuration, said data transfer background process iteratively transferring data from the other physical

10                    disk drives containing the replicated data to a  
                     corresponding physical disk drive location according  
                     to the original configuration and information in said  
                     first list and said second input-output request  
                     handler being responsive to information on said  
15                    second list.

25.    A data store as recited in claim 24 wherein the disk array  
         storage device includes a cache memory for storing write  
         pending data from the host application temporarily before  
         transfer to a physical disk drive, said data store  
5           additionally including a third list of all data in the  
         cache memory to be transferred to the physical disk drives  
         and a pending split background process that transfers data  
         from the cache memory to the replicated data according to  
         its first configuration data location and the information  
10           on the third list.

26.    A data store as recited in claim 25 wherein said copying  
         means and said data transfer and write pending background  
         processes and said input-output request handler operate  
         concurrently.

27.    A method as recited in claim 25 wherein said copying means  
         and said data transfer and write pending background

processes and said input-output request handler means  
operate concurrently with each other and operate  
concurrently and independently of a host application.

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